Circular 54 November, 1914

Hog Cholera
Questions and Answers

F. B. HADLEY

THE STATE HOG CHOLERA SERUM PLANT

Serum for the control of hog cholera in Wisconsin is manufactured here.

AGRICULTURAL EXPERIMENT STATION

OF THE UNIVERSITY OF WISCONSIN

MADISON, WISCONSIN

DIGEST

The State of Wisconsin manufactures hog cholera serum to save her farmers from heavy losses. Funds for the work have been supplied by the legislature. Page 1

There are several forms of hog cholera. The disease is fatal for all breeds of swine. It may "die out" but usually does so only *after several months or years.* Pages 1–5

Hog cholera should be looked upon as a germ disease and handled accordingly. New corn or weather conditions of themselves cannot cause the trouble but are contributing factors to be reckoned with. Page 6

The symptoms of acute hog cholera may differ somewhat in different outbreaks but in the majority of cases are quite uniform. Page 7

To determine whether or not hog cholera infection is actually present in a herd examine sick and dead pigs. Experience is necessary to distinguish between hog cholera and diseases which closely Page 8

To avoid the disease, strict precautions must be taken by the owner. The Agricultural College will gladly aid farmers by holding *meetings to show approved methods of prevention and control.* Pages 10–12

Good care is an important adjunct to the serum treatment which is now recognized as the only reliable agent for the prevention of *hog cholera.* Page 12

Serum is obtained from the blood of hogs rendered highly resistant to the disease. It is a preventive rather than a curative agent and can be purchased from the Agricultural College at cost of production. Pages 13–16

As virus is capable of starting an outbreak of hog cholera it is furnished only to veterinarians who are held responsible for its proper use in the field. Page 16

There are three methods of immunizing hogs. Each has certain advantages and disadvantages. The best method to use depends on *circumstances. Precautions must be taken to handle the hogs* properly before, during, and after the serum treatment for satisfactory results. Pages 18–23

Results from immunizing hogs with serum have been gratifying *when used according to directions.* The money invested in serum should be looked upon as insurance. Pages 23–28

The bulletins of this Station are sent free, upon application, to the *residents of the state. Those desiring to have names entered on regular* mailing lists should apply to H. L. Russell, Director, Madison, Wisconsin.

Hog Cholera Questions and Answers*

F. B. HADLEY

THE NATURE AND OCCURRENCE OF HOG CHOLERA

What is hog cholera? An infectious and communicable disease of swine, characterized by loss of appetite, fever, and other serious disturbances, which usually results in death. It is the most dreaded scourge and reaps the greatest toll of any disease affecting domestic animals in this country today.

In what forms may the disease appear? It appears as (1) a typical blood poisoning or septicemia, (2) an intestinal infection, (3) lung trouble or swine plague, or (4) a mixed infection in which any combination of the first three forms may be seen. These forms may be either acute or chronic. The first

*This bulletin has been written to aid farmers, veterinarians and students of agriculture in understanding the nature of hog cholera and the most approved methods to use in controlling this disease. It supersedes Circular No. 39 entitled "Directions for Vaccinating Against Hog Cholera."

In the spring of 1912 the College of Agriculture started the manufacture of hog cholera serum in a very small way. The reasons for a modest beginning were several. In the first place, hog cholera had not made serious inroads in Wisconsin for many years, at least in the opinion of those who had kept in touch with the live stock interests of the state. There is now reason to believe that outbreaks of the disease had occurred more often than was supposed for no one officer was responsible and reports came in only by chance. As a result, hogs were left to die or recover under nature's care, or were shipped to market for what they would bring.

A second and important reason why it was necessary to start operations in an unpretentious manner was that there was no special fund available for the work. The matter seemed so urgent, however, that the College of Agriculture took enough money from its emergency reserve to justify its Veterinary Department in commencing operations.

Future developments proved this to be a most fortunate investment so far as the swine industry is concerned, for during the succeeding three years hog cholera made an appearance each summer and fall in widely different parts of the state, many of which had never experienced losses from the disease, or certainly not for many years. Although only a relatively small amount of serum was produced during this time, there is good evidence to show that it was used effectively and saved a great many herds in which there would otherwise have been heavy losses.

The State Legislature realized the desirability of supplying serum in large amounts and of bringing it within the reach of more farmers, so appropriated $2,500 a year for two years. It was specified in the law that serum should be furnished to residents of the state at one cent per cubic centimeter. This barely covers the actual cost of manufacture.

The accompanying picture of the new serum plant gives a good idea of how economically part of the money has been used. The unexpended portion is kept in a "revolving fund" for exclusive support of the work. Hundreds of hogs, costing thousands of dollars, are required each year in manufacturing the serum and this money is used in buying them.

is the more common and usually kills in from seven to 14 days. Chronic cholera is milder, runs a slower course and the hog either dies within a month or continues sick for many weeks.

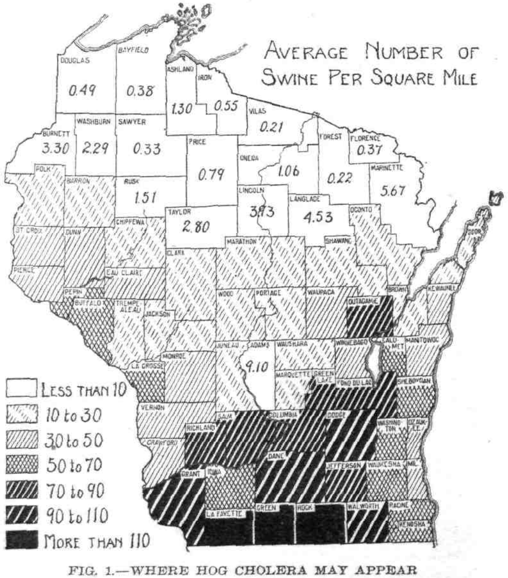

FIG. 1.—WHERE HOG CHOLERA MAY APPEAR

No county of the state is safe from hog cholera. It is more prevalent in the southern part for more hogs are raised there.

Are any breeds of swine naturally immune to hog cholera? No. Mule foot hogs have been advertised as naturally immune, but experience has shown that they are as susceptible to cholera as other breeds and that the disease is quite as fatal. Red hogs seem to be more resistant than those of other colors, but no reliance can be placed upon the natural immunity possessed by hogs of any breed. There is a wide difference in the degree of susceptibility possessed by different individuals.

Is hog cholera a prevalent disease? Fortunately the disease has not been so prevalent in Wisconsin as in the corn-belt states. During the past three years the country, generally, has exper-

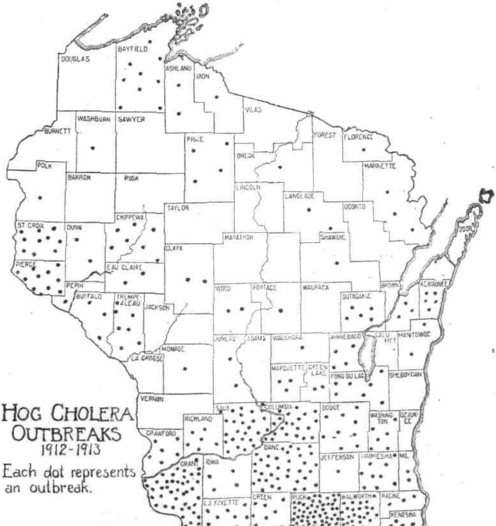

FIG. 2.—WHERE HOG CHOLERA HAS APPEARED

Hog cholera usually takes its greatest toll in those sections where swine raising is engaged in as an important branch of farming. This is due to the better chance for spreading from farm to farm.

ienced enormous losses. By referring to records it is seen that hog cholera sweeps over the country in waves, the high tide occurring about once each decade. We have just passed through such an outbreak and may confidently look forward to a period in which losses should be considerably less.

Does the disease "die out"? In many outbreaks it has been observed that after two or three months hog cholera loses its virulence for large hogs; but it is not safe to count on this turn,

as the chances of introducing fresh infection from outside are many.

THE CAUSE OF HOG CHOLERA

What is the cause of hog cholera? The disease is caused by virus, presumably a germ in the blood, urine, and other body fluids, which is so very small that it can pass through a porcelain filter sufficiently fine to withhold the minutest organisms visible through the most powerful microscope. Up to date all attempts to grow the virus under artificial conditions have been fruitless. The only way to propagate it successfully is in the blood of young, susceptible pigs, where it grows readily. It must, therefore, be stated that the exact nature of the cause of hog cholera has not yet been determined. For practical purposes it may be considered a typical germ disease.

How does the virus of hog cholera gain entrance to the body? In most cases through the digestive tract or through the broken skin. The possibility of the hog acquiring the disease by way of the air passages must be recognized, but such infection probably seldom occurs.

By what means is cholera transmitted from a sick to a healthy herd? By the introduction of the virus either directly by sick hogs, or indirectly by any agent capable of carrying contaminated substances from place to place. (See answers under Prevention and Control.)

What other conditions favor the spread of the disease? Wet poorly ventilated pens, filthy troughs or slop barrels, overcrowded sleeping quarters, sudden change of, or improper and insufficient feed, inbreeding, pampering, in fact anything which lowers the animals' physical condition renders them more susceptible to infection with hog cholera.

Does the season of the year have anything to do with its appearance? It is more prevalent in the summer and fall months. One reason for this is that there are more young pigs on farms then than at other times and the younger animals are more apt to get cholera than older swine. Besides there is unquestionably a much greater opportunity for the disease to be carried from place to place in summer, as there is more traffic in ani-

mals and more frequent visiting between neighbors. In addition, dust is everywhere present and commonly carries the disease. During the winter months hog cholera tends to become less frequent and in many cases seems to be less fatal.

Does new corn cause cholera? No, for cholera can only be caused by the specific virus, mentioned above. But any exclusive feed, especially new corn, predisposes the animal to the disease in that it does not keep the digestive system in good condition. Until they become accustomed to it hogs should receive but a small feed of new corn each day.

Are there other predisposing causes? The age of pigs plays an important part in the disease. Young pigs are more susceptible than older hogs. When pigs especially young one are crowded into close quarters they are more apt to develop hog cholera.

What is meant by "The period of incubation"? This refers to the time which elapses between the exposure of the pig to hog cholera infection and the appearance of visible symptoms of the disease. It varies from a few days in very acute cases to two or three weeks. The period of incubation depends on the susceptibility of the animal, the virulence of the infection and the manner in which the virus enters the body.

The Symptoms of Hog Cholera

*What are the symptoms of acute cholera?** In acute cholera the first few hogs often die very suddenly after having been sick but a short time. In the majority of cases it will be observed that the pigs:

1. Fail to come up to the trough for feed, refuse to eat, or eat earth and other indigestible substances.

2. Have chills and huddle together in the pens and nests to keep warm. They stand with the back arched, the hind feet close together or crossed and the belly tucked up.

3. Resent being disturbed and when they walk appear weak and may stagger and fall. Their muscles and joints are stiff and sore.

* Keeping in mind the different organs of the body which become diseased, it will be understood that the symptoms must vary with the form of cholera present and the organs first affected. It is impossible to give a specific set of symptoms for each case.

4. Are constipated for a few days and then develop a profuse diarrhea which is very offensive and usually persists until death.

5. Have a peculiar hacking cough and breathe abnormally fast as a result of changes in the lungs.

6. Show a puslike discharge from the eyes which often gums the lids together.

7. Develop a fever or rise in temperature from 104° to 109°F. (The normal temperature varies between 100° and 104° F. and higher if the pig has recently been excited or the weather is very hot.)

How does chronic hog cholera differ from the acute? The difference is largely one of duration. There is more marked evidence of digestive disturbance, for ulcers usually form in the intestines when chronic cholera is present. Not infrequently, however, the hogs eat fairly well, which is misleading for the reason that their indisposition is attributed to intestinal parasites or rheumatism. Young hogs become stunted and emaciated. The hair may drop out and portions of the skin die and slough off.

THE DIAGNOSIS OF HOG CHOLERA

What is meant by the term diagnosis? Diagnosis means the ability to tell what ails an animal from its symptoms. An early diagnosis is valuable in saving the herd and preventing the spread of the disease to neighboring herds.

How is hog cholera diagnosed? In the field the diagnosis depends upon the history of the outbreak, the symptoms shown by the hogs and post-mortem changes in the body organs. Hog cholera is the chief acute infectious disease that commonly affects hogs. A careful study of the symptoms as outlined above, together with the intelligent use of the clinical thermometer will help to show which hogs are sick, but practical experience and training are absolutely essential in order to avoid errors.

What post-mortem changes should be looked for? Frequently the skin of the underside of the neck and body becomes a dark red. The lymph glands in various parts of the carcass are enlarged, congested and may be deep red in color. The kidneys are usually dotted with small, pin-point blood spots which cause them to resemble a turkey egg in appearance as in Figure 3.

In some cases the lining membranes of the abdominal and lung cavities show red spots or blotches. If the disease affects the lungs, these organs will exhibit changes characteristic of pneumonia and pleurisy. In chronic cholera intestinal ulcers are frequently found. These ulcers are button-like and have a dark center and yellow margin and are raised above the surrounding surface of the intestine. The heart and liver are seldom altered in appearance.

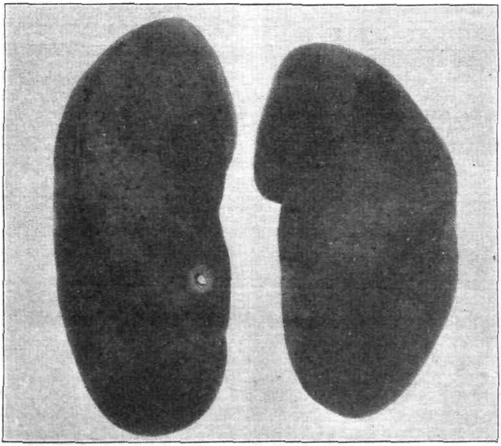

FIG. 3.—KIDNEYS FROM A CHOLERA HOG

The surface of each kidney shows small blood spots which give it a turkey-egg appearance. The white spot is an accessory blood vessel, the presence of which is not uncommon.

How does swine plague differ from hog cholera? In view of the fact that swine plague can be prevented by hog cholera serum there is no need to differentiate between the two. Most investigators consider that swine plague is a form of hog cholera which manifests itself primarily in the lungs.

What conditions and diseases resemble hog cholera? Among the most common diseases which most closely resemble hog chol-

era are pneumonia caused by exposure, dust, lung worms, and poor quarters; indigestion due to improper feeds, especially too much salt in the feed. Worms in the intestines are found in young, unthrifty pigs but independently seldom cause death. A painstaking examination is sometimes necessary to distinguish these troubles from cholera. The feeding of slop and garbage containing strong alkalis, such as soap powders, sets up a series of symptoms which may be confused with those of cholera unless a careful inspection is made. A digestive disturbance known as "slop barrel cholera" has been mistaken for true hog cholera. It is due to decomposed and fermented slop from filthy slop barrels.

THE PREVENTION AND CONTROL OF HOG CHOLERA

What steps should be taken to prevent the introduction of cholera? To avoid infection susceptible hogs must be kept away from the disease. The care and feeding of hogs play a prominent part in its prevention and control. Healthy swine possess more or less resistance to hog cholera, so if an effort is made to maintain the herd in a normal condition there is much less chance of their becoming infected. The following rules have been formulated for guidance in this attempt:

1. Quarantine for four weeks in isolated pens all hogs brought to the farm.

2. Keep away persons, dogs, and all other animals coming from cholera-infected farms.

3. Pasture the hogs at some distance from main highways and away from contaminated streams.

4. Feed a laxative diet. (Heavy rations cause constipation and other digestive disturbances.)

5. Disinfect and whitewash the hog pens each week with quick lime or some other reliable germicidal agent.

6. Vaccinate all hogs while healthy with serum, if the disease is in your locality.

7. Provide covered boxes in which to keep a mixture containing 25 parts of charcoal, 10 parts of salt, and 2 parts of copperas or iron sulphate before the hogs at all times. This is a corrective mixture which stimulates digestion and aids in keeping the pigs free from intestinal worms.

How should a diseased herd be cared for? As soon as cholera is suspected a competent veterinarian should be called to make a positive diagnosis. If he pronounces the disease hog cholera, the State Live Stock Sanitary Board, or its executive officer, the State Veterinarian, should be notified at once and steps taken to control the disease by:

1. Burning the carcasses of hogs that have died from hog cholera, also all litter and waste from the pens.

2. Taking the temperature of each hog to determine which are infected. Those with temperatures less than 104 degrees should be given the serum treatment. As very sick animals will not respond to the treatment they should be killed and burned.

3. Disinfecting the pens and yards with a liberal application of quicklime both dry and as whitewash. Most commercial disinfectants are effective if used according to directions. A four per cent solution of compound cresol in water is a reliable disinfectant.

4. Filling up wallows, boarding up insanitary nesting places, and providing dry commodious quarters.

5. Feeding a very light slop ration of shorts or other ground feed to which Doctors Craig and Whiting of Purdue University advise* the addition of pulverized sopper sulphate (blue vitriol). The doses may be conveniently regulated by dissolving eight ounces of this drug in one gallon of warm water and then adding one pint of this solution to each ten gallons of slop or water.

May sick hogs, or hogs from a cholera-infected herd be sold? Ordinarily they should not for their urine and other excreta contain the disease-producing germs and the highways over which they are transported will surely become infected. It is to the interest of the public at large to strictly enforce measures to guard our live stock against infectious diseases. This will result in a temporary hardship to the farmer who has cholera-sick hogs, but in the long run is the only way by which the disease can be effectively controlled.

Will the Agricultural College aid farmers to prevent hog cholera? Yes, by holding public vaccination demonstrations and conducting meetings to instruct as to approved methods of sanitation which are of first importance. At these meetings di-

* Craig, R. A. and Whiting, R. A., Hog Cholera. Ind. Agr. Exp. Sta. Bull. 173.

rections will be given for handling herds so that the farmer, by his own efforts, may prevent losses. Ten or more interested swine-raisers should make a signed request to the Director of the Agricultural Experiment Station, Madison, who will arrange for dates.

How may herds be protected against cholera in those sections where the disease appears nearly every year? Each spring and fall all pigs should be immunized with injections of serum and virus when they attain a weight of fifty pounds or more. This method has been demonstrated to be eminently practical in the University herd and in many other herds in different parts of the state. It may be relied upon as the best plan to pursue in communities where hog cholera makes annual visitations.

What should be done when hog cholera occurs on a neighbor's farm? All hogs must be kept from pastures located near public roads or adjacent to other herds, and nobody allowed access to the hog lot and pens but the person who attends to the feed and care. With these precautions and by shutting the herd into a recently disinfected hog house with a small yard they may be prevented from catching the disease for many weeks.

THE TREATMENT OF HOG CHOLERA

Will a hog recover from cholera without treatment? Most hogs possess a certain amount of natural resistance to cholera. For this reason it is not rare to find that a few animals recover from the disease with no treatment whatsoever. The percentage of recoveries is so small in most outbreaks that aid must be given to prevent what would be almost complete loss.

Can reliance be placed in the so-called "hog-cholera cures"? There is no "medicine" known which has the power to cure a cholera-sick hog. The favorable results which sometimes follow the use of these patent medicines or cures ought to be attributed to the natural immunity of the animals rather than any curative effect of the remedy.

Does the care given a herd play any part in averting hog cholera? Without doubt proper care, feed and sanitary quarters are influential factors in controlling hog cholera. These alone are responsible for the recovery of many animals which

otherwise would have died. When combined with the serum treatment gratifying results are almost sure to follow, provided only a short time elapses between the serum treatment and the appearance of the disease in the neighborhood.

What is meant by the serum treatment? It is the injection of a specially prepared blood serum which is now conceded to be the only satisfactory agent or medicine that is capable of preventing hog cholera. It must be understood that reliance should

FIG. 4.—SERUM AND VIRUS READY FOR USE

When ordering serum state as closely as possible the amount required for it is not returnable.

not be placed in the serum treatment as the only means of saving the herd. The other preventive measures mentioned in this circular are also necessary if the disease is to be controlled.

HOG CHOLERA SERUM

What do the words immunity and hyperimmunity mean? Immunity is that condition of the body by virtue of which it resists the development of certain diseases. It may be either natural or acquired. Immunity to hog cholera is almost always acquired either by recovery from an attack of the disease or by vaccination with hog cholera serum and virus. By hyperimmunity is meant a still higher degree of immunity. It is

only produced by artificial means. Immunity is just the opposite of susceptibility, which is a liability to disease.

What is hog cholera serum? It is the blood serum of a hog which has been made hyperimmune to hog cholera. It should be highly "potent", that is, contain a large number of "protective or immune bodies" against the disease.

How is it prepared? Healthy, active, immune hogs with long tails are selected to furnish the serum. They are hyperimmunized by injecting five or six cubic centimeters of virus (disease-producing blood) per pound of body weight into the ear vein. In from 10 to 14 days the hogs' blood should contain protective or immune bodies sufficient to protect susceptible hogs against cholera. The animals are then ready to bleed. This is done by confining the hogs and cutting off pieces of their tails to allow the blood to flow freely. About six cubic centimeters of blood per pound of body weight is drawn from each hog, after which it is released and allowed to recuperate for a week, when the bleeding process is repeated. After three tail bleedings have been made the hog must be rehyperimmunized or reinforced with virus to stimulate the production of a further supply of immune bodies. Usually the hog will be ready for bleeding one week after the reinjection with virus. It is then bled twice from the tail and after the usual interval is bled to death by cutting the blood vessels of the neck. The hyperimmune blood is immediately beaten with a stiff wire to remove the fibrin (a white substance formed in the coagulation of the blood) and prevent clotting. Then 0.5 per cent of carbolic acid is added as a preservative. The serum is next subjected to a severe test against an active strain of virus by injecting it in graduated doses into susceptible pigs which are inoculated simultaneously with virus. This test is to determine its protective properties. If it proves potent it is bottled and stored in a refrigerator until required for use.

Is hog cholera serum a "cure" for hog cholera? It cannot be considered a cure for this disease, although many times favorable results follow its injection even after the hog has developed a fever. Little or no benefit is noticeable after the animal has been sick any length of time. Hog cholera serum should,

therefore, be used with the understanding that it is a preventive rather than a curative agent.

How long will serum retain its potency? If kept at a temperature between 40° and 50° F. in stoppered bottles and away from the light, properly prepared serum, reasonably free from bacterial contamination, should retain its protective properties for at least six months.

From whom may hog cholera serum be purchased? The Veterinary Department of the Agricultural Experiment Station sells the serum to residents of Wisconsin. Many commercial firms manufacture serum which is for sale on the open market. But only those firms which have a government license, the number of which should appear on the bottles of serum, should be patronized. Federal inspectors who supervise the manufacture and testing of serum, are maintained at these plants. Although no guarantee goes with the products of these plants, it is safe to assume that they are properly prepared and if fresh, should be as good as money can buy.

Does the Experiment Station guarantee the serum which it sends out? No guarantee whatsoever goes with the serum. Every reasonable effort is made to produce the best serum possible. Responsibility for the serum ceases after it leaves Madison.

What is the cost of serum? Under state law serum is furnished by the Veterinary Department of the Agricultural Experiment Station at Madison to any bona fide resident of Wisconsin who is engaged in the raising of hogs for one cent per cubic centimeter. This means that it would cost about forty cents for serum sufficient to immunize a healthy pig weighing between 75 and 100 pounds. In no case is serum furnished free of charge.

How can the amount required for the treatment of a given herd be determined? By first counting the number of hogs of different weights and then computing the amount from the dose table on page 21. It is better to overestimate the weights than to run a chance of being short when the serum is used. The loss resulting from the death of but one pig in most cases would more than pay for the additional serum.

How is shipment made? Unless a remittance accompanies the order shipment is made by express, C. O. D., at the earliest opportunity. In case the demand for serum exceeds the supply, orders are filed and filled in the order in which they were received. The observance of this rule is insisted upon in order to treat all alike and avoid partiality in supplying serum. Bottles holding 900 cc., 450 cc., and 200 cc. are used in shipping the serum. So far as possible orders should be confined to these denominations or their multiples.

HOG CHOLERA VIRUS

What is hog cholera virus? It is the blood from a pig very sick with hog cholera. At the time of drawing it is beaten to remove the fibrin so it cannot clot. Then 0.5 per cent of carbolic acid is added to preserve it for field use.

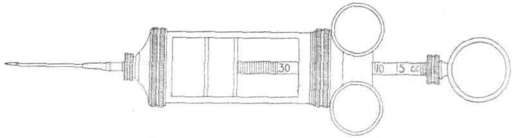

FIG. 5.—HYPODERMIC SYRINGE FOR SERUM

By adjusting the thumb-screw on the piston rod it is possible accurately to gauge the dose. Syringes with glass barrels and rubber packing have been found best.

How is it obtained? Young, thrifty pigs from 50 to 100 pounds in weight are inoculated with or exposed to hog cholera. They must develop marked symptoms of the disease, preferably within ten days, and are then killed and their blood—the virus—is recovered. This is used to hyperimmunize hogs for the production of hog cholera serum, and is also for use in the simultaneous and combination methods of treatment. "Field virus" is secured from natural outbreaks of the disease but is not so reliable because there is no satisfactory way of standardizing it.

How long will virus remain suitable for use? Virus should not be more than two weeks old when used, even if it has been preserved with carbolic acid, for it rapidly loses its virulence and weak virus often gives disappointing results because but a partial immunity is conferred on the animal by its use.

Is virus dangerous to handle? Virus is hog cholera in a concentrated form and must be used with great caution. On account of the danger from spreading the disease by careless handling, a law was passed in Wisconsin limiting its use to graduate veterinarians and only by them with the knowledge and consent of the state veterinarian. When properly used, virus has a distinct field of usefulness in the control of hog cholera.

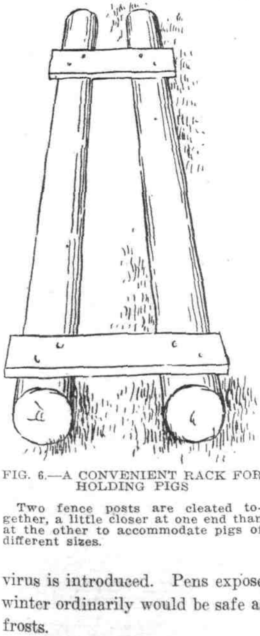

FIG. 6.—A CONVENIENT RACK FOR HOLDING PIGS

Two fence posts are cleated together, a little closer at one end than at the other to accommodate pigs of different sizes.

What does virus cost? Only a small quantity is required for field use so at present it is furnished free to approved parties who apply to the Experiment Station. The high price which now prevails for pigs may necessitate in the future a small charge for virus.

How long after pens have become infected is it safe to use them for susceptible pigs? This will depend on the thoroughness with which the pens were cleaned and disinfected and the opportunity given for contact with sunlight and air. Hog cholera usually dies out in two years in a given community unless a new strain of virus is introduced. Pens exposed to the rigors of a Wisconsin winter ordinarily would be safe as the virus is killed by repeated frosts.

THE USE OF SERUM AND VIRUS

How are serum and virus given to a hog? By subcutaneous injections with hypodermic syringes. A syringe of 20 or 30 cubic centimeters capacity is best for the serum which is given in

relatively large doses. For the virus a smaller syringe holding 5 or 10 cc. should be employed. Before use the syringes must be disinfected or sterilized to render them free from injurious bacteria which might cause an abscess at the point of injection or even blood poisoning.

Where can syringes for injecting serum and virus be purchased? Special syringes for the treatment of hog cholera may be obtained from any one of the surgical supply firms in Chicago which handle veterinary instruments. The price varies with the quality. A satisfactory syringe can be bought for about $4. When ordering specify the capacity of the syringe desired and the use for which it is intended. The Agricultural College does not engage in commercial activities so is not in a position to furnish these instruments.

What are the different methods of immunizing hogs? (1) The serum-alone, (2) the simultaneous, and (3) the combination methods.

I THE SERUM-ALONE METHOD consists simply in an injection with hog cholera serum only. A temporary or passive immunity lasting from six to ten weeks is conferred on healthy hogs. If the animals are exposed to hog cholera at the time of treatment, or very soon after, their immunity will be permanent or active, corresponding to that produced by

II THE SIMULTANEOUS METHOD which consists of injecting the hog cholera serum and at the same time, that is, simultaneously, inoculating it with a small quantity of virus or disease-producing blood. This sets up a very mild form of the disease which is rapidly overcome by the influence of the antibodies in the injected serum and those produced in the animal's body and a permanent immunity follows.

III THE COMBINATION OR DOUBLE METHOD, as the name indicates, is a combination of the single and simultaneous methods. The hog is first treated with the serum alone and after a week or ten days with serum and virus. An immunity which is permanent in character should follow this method of treatment.

What are the advantages and disadvantages of each method? The serum-alone method is unquestionably the safest and least expensive, but it cannot be recommended as the most economical unless the herd has recently been exposed or the disease is

actually present in the herd. The chief objection to its use in healthy herds is that it insures against loss for a short time only. Both the simultaneous and combination methods have the advantage over the above method in that they can be used at almost any time of year with good success and reasonable assurance can be placed in the immunity of treated hogs. When the simultaneous method is used there is some danger of cholera developing from faulty administration and poor serum, which is a decided disadvantage. Unsatisfactory results have followed the simultaneous method in infected herds. The combination method which combines the good qualities of the other two methods and in addition almost completely eliminates the danger of loss which accompanies the simultaneous treatment is recommended. Its first or initial cost is slightly greater but the increased probability of successful results more than overcome this difference.

Which method is best? In deciding which of the three methods to use, one must be guided by the length of immunity required, the value of the herd, and whether cholera is or is not present. If a permanent immunity is desired the combination or simultaneous method is advised. If hog cholera exists in the herd only the serum should be used. Later if desirable the serum and virus may be employed with much more safety. For sows well advanced in pregnancy the serum-alone method is advised, for the virus may produce a fever and cause abortion. In neighborhoods where the disease has not made an appearance the serum-alone method is the only method to use as there is no possibility of starting a center of infection as would be the case if virus was employed. The combination and simultaneous methods are especially useful in healthy herds in localities where hog cholera has recently broken out or has prevailed during the past year.

Before using serum, how should the hogs be handled? A day or two before the serum treatment is given, a light, laxative diet should be fed. Keep the hogs in clean, dry quarters and allow them a plentiful supply of drinking water. Do not excite them for a rise in the body temperature would occur which might lead to a false interpretation when the serum is administered.

How is the temperature taken? By inserting a clinical or veterinary thermometer into the rectum of the hog. The normal temperature varies from 100° to 104° depending upon such things as recent exercise, excitement, time of day, atmospheric conditions, and wound infection. If it is necessary to restrain the hogs in order to take their temperatures, they may be hurdled into a corner or placed in a crate.

Is it necessary to employ a veterinarian to treat the hogs? It is strongly urged that only a qualified veterinarian or other experienced person be employed to administer the serum treatment, for in a large measure good results depend on the proper handling of the serum and virus. Serum alone may be given by the owner if he has the required instruments. According to a state law, virus can be used only by veterinarians and not by them without the knowledge and consent of the state veterinarian. Poor results are usually traceable to incompetence in giving the treatment.

What is a reasonable charge for the services of the veterinarian? This will depend largely on the distance he has to drive, the number of hogs treated and the time spent at the farm. The longer the veterinarian is away from his office the greater will be his fee.

Does the state employ field veterinarians to investigate outbreaks? A limited number of assistants are in the employ of the state veterinarian who has charge of the enforcement of the live stock sanitary laws. After a local veterinarian has satisfied himself that hog cholera exists in a given neighborhood, he or the owner of the hogs should inform the state veterinarian. If possible the latter will send a deputy to investigate the outbreak and advise as to methods of handling the situation, if in his judgment the case seems important enough to justify the expense. The College of Agriculture is cooperating with the United States Department of Agriculture in this control work. At present a specially trained hog cholera field agent is located at the College. His services are at the disposal of residents of Wisconsin who need advice along these lines.

What is the proper dose of serum? The dose varies with the weight as shown by Table I. It is false economy to cut down the dose of serum, for experience has shown that in such cases the results from its use have been unsatisfactory.

TABLE I.—DOSES OF HOG CHOLERA SERUM

Weights of hogs		With virus or for infected hogs	Without virus for healthy hogs
From	To		
Lbs.	Lbs.	Cc.	Cc.
0	20	15	10
20	50	25	20
50	75	35	25
75	100	40	30
100	150	50	35
150	200	55	40
200	300	65	45
300	400	85	65
400	600	100	85

Where are injections made? The serum should be injected into the armpits of pigs in preference to the ham which, if abscesses form, would become unsuitable for food purposes. Virus is best introduced beneath the skin at the center of the space between the fore legs. This prevents the two substances from mechanically mixing after injection which would cause them to neutralize each other and be ineffective. Large hogs should be snubbed up to a post and given the injection in the fold of loose skin at the side of the neck, as indicated in Figure 8.

How should the site of injection be prepared? The skin should be washed clean and scrubbed with soap and warm water. A disinfectant is then applied such as a four per cent solution of carbolic acid or pure grain alcohol. In cold weather the skin may be brushed clean with a stiff bristled dry brush and tincture of iodine applied over an area the size of a silver dollar where the syringe needle is to enter.

Is it advisable to vaccinate young pigs? There are several distinct advantages in vaccinating young pigs. They are easier to handle; less serum is needed, so the cost is correspondingly smaller; and it insures against loss when they get older. It should be understood that young pigs fail to respond to the serum and virus treatment in a satisfactory manner as they out-

FIG. 7.—VACCINATING A PIG IN THE ARMPIT

The rack illustrated by Figure 6 is here shown in actual use. One man can hold a 150-pound pig without difficulty.

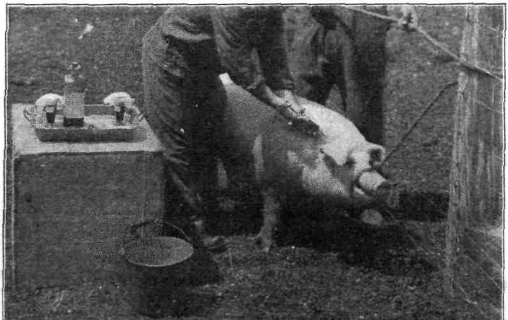

FIG. 8.—VACCINATING A MATURE HOG BEHIND THE EAR

The rope, noosed around the upper jaw, effectively holds the animal while treatment is administered.

grow the immunity after a few months and again become susceptible to the cholera. Therefore to be sure that they will not succumb later to the disease all pigs vaccinated when small should be treated again when they reach 50 pounds in weight.

What is the proper dose of virus? As with serum the dose of of virus is regulated by the size of the hog. Table II shows the exact amount for hogs of different weights.

TABLE II.—DOSES OF HOG CHOLERA VIRUS

Weights of hogs		With serum
From	To	
Lbs. 0	Lbs. 30	Cc. 0.5
30	100	1.0
100	200	1.5
200	600	2.0

What animals should not be given virus? Under ordinary circumstances, it is best to postpone giving virus to hogs with temperatures above 104.5° F. Sows well advanced in pregnancy may abort, if inoculated with virus. Hogs suffering from chronic cholera fail to react to the serum and virus treatment and, therefore, should be given the serum-alone treatment. Recently castrated animals are less resistant and may succumb to cholera if given virus.

How should hogs be cared for after treatment? The diet should be of slop and about half the usual quantity should be given for eight or ten days. A sudden change in the feed should not be made as the vitality of the hog might be reduced thereby and results from the serum treatment disappointing. At the first sign of sickness the ration must be reduced one-half. After two weeks the ration may be increased and by the fourth week the pigs should be in condition to stand full feed. Clean, dry, well-ventilated quarters are essential. In seasonable weather the pigs may be allowed to run on clover, alfalfa, or rape pasture, provided they do not have access to running streams or wallows. During the summer months shaded places must be arranged to protect them from the hot sun. A plenti-

ful supply of clean drinking water should be kept accessible at all times.

RESULTS FROM IMMUNIZING HOGS

What reaction follows the use of serum alone? There should be little or no reaction from injecting serum alone. If the injection was made into the arm pit the hogs may be lame for a few days but rapidly recover. Occasionally abscesses occur at the point of injection, due to dirty instruments, failure to clean the skin properly before the serum was injected. In these cases an incision may be necessary to provide drainage for the accumulated pus. Although it may last three months the immunity following this treatment is not to be depended upon longer than one month if cholera is in the vicinity.

What reaction follows the use of serum and virus? In from six to ten days after treatment a "reaction fever" sets in and the temperature may rise to 106 degrees, or higher, due to the influence of the virus. Variations occur as a result of a difference in the susceptibility of different hogs and the virulence of the virus, or difference in the protective properties of the serum. Often the hogs lose appetite, have chills, and present other symptoms of a mild attack of cholera. These symptoms should disappear after a few days without affecting the animals to any marked degree. In reality a mild attack of cholera is set up, recovery from which results in immunity. It should be remembered that deaths from cholera do occasionally occur in hogs which were perfectly healthy before treatment. For this reason, it is best to handle a herd, after serum and virus have been given, in the same manner that a naturally infected herd is handled and to keep the hogs on farms where treated for three weeks immediately following the treatment. In this way the possibility of spreading hog cholera by the use of the simultaneous or combination methods of treatment is reduced. Hogs treated by these methods do not communicate the disease to others or infect their pens unless they become sick themselves. It frequently has been demonstrated that it is not necessary to produce cholera even in a mild form to obtain a permanent immunity.

How long after treatment with serum and virus will hogs be immune? The length of the period of immunity varies with

the individual and the character of the virus used. Mature hogs are protected for at least a year and often for life, but pigs treated before they attained fifty pounds in weight must be given a later treatment to insure a permanent immunity. Experiments made at the Wisconsin Experiment Station have shown that hogs treated 18 months previously were sufficiently immune to withstand large doses of virus without harm. To insure against losses, it will be found best to revaccinate all hogs after one year, especially if cholera is in the neighborhood.

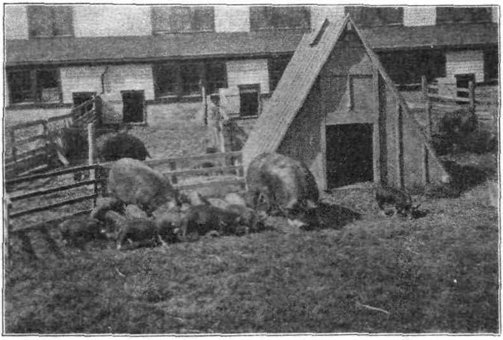

FIG. 9.—CHOLERA-IMMUNE SOWS WITH THRIFTY PIGS

Notice the portable, sanitary hog house and the well-grassed yard—both important factors in successful swine-raising.

Are pigs from actively immune sows resistant to cholera? While suckling, pigs obtain protective substances in part from the milk. These are usually sufficient to confer a temporary or passive immunity to this disease. When weaned the pigs gradually lose their immunity and become just as susceptible as other pigs. Experience has shown that no reliance can be placed in the immunity imparted by the sow.

Is it possible to immunize suckling pigs by any other method than the use of serum? Yes, the so-called "V. B." or Minnesota method which consists of injections of virulent blood alone, has been used on pigs from immune sows with some success.

This method is not recommended for general use. The four hogs in the foreground of the frontispiece were given this treatment and have an exceptionally interesting history. They were the offspring of an immune sow at the Plant. When two weeks old they were given two cc. of virus but did not become sick with cholera as they were protected through the immunity imparted by the sow. One year later these hogs were injected with five cc. of fresh, strong virus to test their immunity, which proved to be high, for they did not sicken. Later they were hyperimmunized with large quantities of virus injected into the ear veins. Each hog was bled several times and furnished a potent serum. This illustrates the possibility of raising cholera-immune hogs by simply injecting them with virus.

What responsibility is assumed by the farmer who uses hog-cholera serum from the College of Agriculture? He agrees to fill out and promptly return report blanks showing the results from the use of serum in his herd. Accurate reports are valuable in determining just what the serum does under farm conditions and are necessary as a reliable means of checking experimental tests against practical results.

What are the usual causes for poor results with serum and virus? (1) Infection in the herd at time of treatment; (2) too small doses of serum; (3) a serum weak in potency from any cause; (4) a serum contaminated with such disease-producing germs as those of pneumonia, lock-jaw, blood-poisoning, or tuberculosis; and (5) poor virus.

What results have been obtained from the use of hog cholera serum in Wisconsin? Table III summarizes the results reported in both cholera-free and infected herds. It should be understood that vaccination against hog cholera does not give perfect results, for no known biological product has this power. Although the treatment is not infallible, the successes obtained demonstrate conclusively that it is the only reliable agent to use. Attention is called to the necessity, if reliable statistics are to be compiled, of filling out and returning the blanks mentioned above showing the results from the use of serum. Farmers and veterinarians are requested to aid the Agricultural College in this important work by promptly returning the blanks sent them.

TABLE III.—SUMMARY OF RESULTS WITH VARIOUS METHODS OF VACCINATING HOGS AGAINST CHOLERA IN WISCONSIN

(To June 30, 1914)

METHOD OF VACCINATION	CONDITION WHEN TREATED	NUMBER TREATED	DEATHS	RECOVERIES	
				No.	Per cent
Serum—alone	Healthy	5,369	11	5,358	99.79
	Infected	6,009	957	5,052	84.07
Simultaneous	Healthy	850	106	744	87.53
	Infected	449	166	283	63.03
Combination	Healthy	4,524	210	4,314	95.36
	Infected	372	35	337	90.59
All methods	Healthy	10,743	327	10,416	96.96
	Infected	6,820	1,148	5,672	83.17
Total		17,563	1,475	16,088	91.60

TABLE IV.—NUMBER OF HOGS IN WISCONSIN BY COUNTIES WITH PERCENTAGE OF LOSS FROM HOG CHOLERA FOR THE YEAR 1913

Southern Counties	Number of swine	Percentage of loss from hog cholera
Columbia	55,946	9
Crawford	22,428	0
Dane	126,227	12
Dodge	88,061	3
Grant	114,997	8
Green	83,880	7
Iowa	47,361	3
Jefferson	43,650	0
Kenosha	14,377	10
Lafayette	80,428	...
Milwaukee	7,241	10
Ozaukee	10,113	0
Racine	21,449	5
Richland	45,061	10
Rock	79,720	20
Sauk	59,393	1
Vernon	28,387	...
Walworth	56,528	35
Washington	28,727	...
Waukesha	28,668	3

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Lafayette	80,428	...
Milwaukee	7,241	10
Ozaukee	10,113	0
Racine	21,449	5
Richland	45,061	10
Rock	79,720	20
Sauk	59,393	1
Vernon	28,387	...
Walworth	56,528	35
Washington	28,727	...
Waukesha	28,668	3

TABLE IV.—NUMBER OF HOGS IN WISCONSIN BY COUNTIES WITH PERCENTAGE OF LOSS FROM HOG CHOLERA FOR THE YEAR 1913—continued

Central Counties	*Number of swine*	Percentage of loss from hog cholera
Adams	6,206	0
Brown	15,060	5
Buffalo	40,451	0
Calumet	18,265	0
Clark	16,611	0
Eau Claire	19,921	2
Fond du Lac	59,202	0
Green Lake	32,150	2
Jackson	18,616	0
Juneau	14,067	0
Kewaunee	11,685	10
La Crosse	26,518	0
Manitowoc	21,026	0
Marquette	11,634	3
Monroe	29,147	0
Outagamie	48,576	20
Pepin	12,495	0
Pierce	21,526	13
Portage	13,264	0
Sheboygan	28,224	0
Trempealeau	21,989	0
Waupaca	23,672	0
Waushara	17,729	0
Winnebago	30,041	1
Wood	8,136	1
Northern Counties		
Ashland	1,212	0
Barron	10,571	0
Bayfield	563	0
Burnett	2,906	...
Chippewa	17,181	0
Door	8,343	0
Douglas	649	...
Dunn	34,348	2
Florence	184	2
Forest	306	0
Iron	429	...
Langlade	3,874	0
Lincoln	8,478	0
Marathon	18,079	0
Marinette	7,917	3
Oconto	12,577	0
Oneida	956	0
Polk	13,847	0
Price	986	5
Rusk	1,409	0
Sawyer	439	0
Shawano	32,920	0
St. Croix	24,469	0
Taylor	2,706	0
Vilas	198	...
Washburn	1,913	0
Total	1,809,831	[illegible]

NOTE.—These statistics are incomplete as losses must have occurred in Lafayette, Washington, Fond du Lac, Portage, Trempealeau, Chippewa and St. Croix counties in which outbreaks of hog cholera were reported during 1913 to the Agricultural College. Figures compiled by Wisconsin State Board of Agriculture and U. S. Census Bureau.